

CLAIMS

What is claimed is:

1. An organic light emitting device comprising;
a substrate;
a lower electrode on the substrate;
at least one organic thin film layer disposed on the lower electrode; and
an upper electrode disposed on the at least one organic thin film layer comprising a conductive material, the upper electrode including at least a first thin film having a first grain density of the conductive material and a second thin film having a second grain density of the conductive material other than the first grain density.
2. The device of claim 1, wherein one of the first and second thin films having a highest one of the first and second grain densities is formed farthest away from the substrate, and the one thin film having the highest grain density acts as a passivation layer that prevents moisture and/or oxygen from infiltrating past the one thin film to the at least one organic thin film layer.
3. The device of claim 2, wherein the first and second thin films form a boundary surface therebetween due to a difference in the first and second grain densities.
4. The device of claim 1, wherein the first and second thin films of the upper electrode have the same conductive material.
5. The device of claim 1, wherein the first grain density has a lower grain density than the second grain density, and the first and second thin films are successively formed on the organic thin film layer.
6. The device of claim 1, wherein the first and second thin films comprise aluminum thin films.
7. An organic light emitting device comprising;
a substrate;

a lower electrode disposed on the substrate;
at least one organic thin film layer disposed on the lower electrode; and
an upper electrode disposed on the at least one organic thin film, the upper electrode comprising at least a first thin film having a conductive material having a first grain size and a second thin film having the conductive material having a second grain size other than the first grain size.

8. The device of claim 7, wherein one of the first and second thin films having a smaller one of the grain sizes is formed as the thin film farthest from the substrate, and the one thin film having the one smaller grain size acts as a passivation layer that prevents moisture and/or oxygen from infiltrating.

9. The device of claim 7, wherein the first and second thin films form a boundary surface therebetween due to a difference of the first and second grain sizes.

10. The device of claim 7, wherein the at least first and second thin films have the same conductive material.

11. The device of claim 7, wherein the first thin film has a larger grain size than the grain size of the second thin film, and the first and second films are successively formed on the organic thin film layer

12. The device of claim 11, wherein the first thin film has a grain size at or between 10 nm and 1 μm and a space between adjacent grains is at or between 1 nm and 100 nm, and the second thin film has a grain size at or below 100 nm and a space between adjacent grains is at or below 5 nm.

13. The device of claim 11, wherein the first thin film has a surface roughness of at or between 60 and 70 Å, and the second thin film has a surface roughness of at or between 10 and 50 Å.

14. The device of claim 11, wherein the first thin film and the second thin film comprise aluminum thin films.

15. An organic light emitting device comprising:
a substrate;
a lower electrode on the substrate;
at least one organic thin film layer on the lower electrode; and
an upper electrode on the at least one organic thin film layer, the upper electrode comprising a conductive material that has an increasing grain density and decreasing grain size as a function of the distance from the substrate so as to serve as an electrode so as to apply a predetermined voltage to the organic thin film layer and to form a passivation later that prevents moisture and/or oxygen from infiltrating into the organic thin film layer.

16. The device of claim 15, wherein a grain size of a first surface of the upper electrode is at or between 10 nm and 1 μ m, a grain size of a second surface is at or below 100 nm, and the first surface is disposed adjacent the at least one organic thin film layer and is between the second surface and the at least one organic thin film layer.

17. The device of claim 15, wherein the upper electrode comprises an aluminum thin film having the first and second surfaces.

18. A method of fabricating an organic light emitting device, comprising:
forming a lower electrode on an insulating substrate;
forming an organic thin film layer on the lower electrode; and
successively forming first and second thin films on the organic thin film to form an upper electrode, the first thin film having a first grain density of a conductive material other than a second grain density of the conductive material of the second thin film.

19. The method of claim 18, wherein the first grain density is less than the second grain density, and
the successively forming the first and second thin films comprises
depositing the first thin film by either a thermal evaporation method or an ion beam assistance deposition method, and
depositing the second thin film by the ion beam assistance deposition method using an ion assist beam.

20. The method of claim 19, wherein:

the first thin film is an Al thin film having a grain size is 10 nm to 1 μm , a space between adjacent grains is at or between 1 and 100 nm and a surface roughness is at or between 60 and 70 Å, and

the second thin film is an Al thin film having a grain size is below 100 nm, a space between adjacent grains is at or below 5 nm, and a surface roughness is at or between 10 and 50 Å.

21. The device of claim 2, wherein the first and second thin films comprise corresponding gradual changes in grain densities as a function of thickness such that adjacent sides of the first and second thin films have substantially the same grain densities.

22. The device of claim 7, wherein the first and second thin films comprises corresponding gradual changes in grain sizes as a function of thickness such that adjacent sides of the first and second thin films have substantially the same grain sizes.

23. The device of claim 15, wherein a space between adjacent grains is at or between 1 nm and 100 nm at a first surface, a space between adjacent grains is at or below 5 nm at a second surface, and the first surface is disposed adjacent the at least one organic thin film layer and is between the second surface and the at least one organic thin film layer.

24. An organic light emitting device comprising:
a substrate;
a lower electrode on the substrate;
at least one organic thin film layer on the lower electrode; and
an upper electrode comprising a conductive material disposed between a first surface and a second surface, the first surface being disposed between the second surface and the at least one organic thin film layer,
wherein a first density of the conductive material at the first surface is less than a second density of the conductive material at the second surface and a density between the first and second surfaces of the upper electrode is at or between the first and second densities.

25. The organic light emitting device of claim 24, wherein a grain size of the conductive material at the first surface is greater than a grain size of the conductive material at the second surface.

26. The organic light emitting device of claim 24, wherein the density of the conductive material increases as a function of distance from the first surface toward the second surface.

27. The organic light emitting device of claim 26, wherein the function by which the density varies is a step function in which, at a portion of the upper electrode between the first and second surfaces, the density increases by a predetermined amount that is at or less than a difference between the first and second densities.

28. The organic light emitting device of claim 27, wherein the upper electrode comprises a first layer comprising the conductive material having the first density and a second layer comprising the conductive material having the second density and contacting the first layer such that the predetermined amount is the difference between the first and second densities.

29. The organic light emitting device of claim 28, wherein the first surface is an outermost layer of the upper electrode closest to the at least one organic thin film layer and the second surface is an outermost layer of the upper electrode farthest from the at least one organic thin film layer.

30. The organic light emitting device of claim 26, wherein the function by which the density varies is a gradual function.

31. The organic light emitting device of claim 30, wherein the gradual function comprises a linear function.

32. The organic light emitting device of claim 30, wherein the gradual function comprises a non-linear function.

33. The organic light emitting device of claim 30, wherein the first surface is an outermost layer of the upper electrode closest to the at least one organic thin film layer and the second surface is an outermost layer of the upper electrode farthest from the at least one organic thin film layer.

34. The organic light emitting device of claim 24, wherein the upper electrode comprises grains of the conductive material, a grain size of first grains of the conductive material at the first surface is at or between 10 nm and 1 μ m, and a grain size of second grains of the conductive material at the second surface is at or below 100 nm.

35. The organic light emitting device of claim 24, wherein the conductive material comprises aluminum such that the upper electrode comprises an aluminum thin film.

36. The organic light emitting device of claim 24, wherein the upper electrode comprises grains of the conductive material, a first space between adjacent grains of the conductive material at the first surface is at or between 1 nm and 100 nm, and a second space between adjacent grains of the conductive material at the second surface is at or below 5 nm.

37. The organic light emitting device of claim 24, wherein a first surface roughness of the first surface is at or between 60 Å and 70 Å root mean square, and a second surface roughness of the second surface is at or between 10 Å and 50 Å root mean square.